Amendments to the Claims

This listing of claims will replace all prior versions, and listing, of claims in the application:

1. (Original) A digital payload for processing a sub-band spectrum received on an uplink beam at a communications satellite, the digital payload comprising:

   a digital channelizer configured to divide the sub-band spectrum into a plurality of frequency slices;

   a digital switch matrix configured to route each of the plurality of frequency slices to at least one of a plurality of receiving ports; and

   a digital combiner configured to communicate with the receiving ports to receive the plurality of frequency slices and to re-assemble the plurality of frequency slices to thereby form a plurality of output sub-bands for transmission on an output beam of the communications satellite.

2. (Currently Amended) The digital payload of claim 1 further comprising a digital regeneration module configured to demodulate ~~at least a portion of the sub-band spectrum~~each of the plurality of frequency slices to extract a digital bitstream therefrom, to digitally process the bitstream, and to remodulate the bitstream after processing.

3. (Original) The digital payload of claim 2 wherein the digital regeneration module is further configured to digitally process the bitstream by performing error correction.

4. (Original) The digital payload of claim 2 wherein the digital regeneration module is further configured to digitally process the bitstream by performing code division multiplexing.

5. (Original) The digital payload of claim 2 wherein the digital regeneration module is further configured to digitally process the bitstream by performing access control.

6. (Original) The digital payload of claim 2 wherein the digital regeneration module is further configured to digitally process the bitstream by performing network registration.

7. (Original) The digital payload of claim 2 wherein the digital regeneration module is further configured to digitally process the bitstream by performing cryptographic manipulation of the bitstream.

8. (Original) The digital payload of claim 1 further comprising a controller configured to monitor bandwidth consumption of the sub-band spectrum and to adjust the bandwidth consumption in response thereto.

9. (Original) The digital payload of claim 1 further comprising a built-in test circuit.

10. (Original) The digital payload of claim 1 further comprising an analog to digital (A/D) converter configured to receive the uplink beam and to produce the sub-band spectrum therefrom.

11. (Original) The digital payload of claim 10 wherein the A/D converter is further configured to sample the uplink beam at an IF frequency rate.

12. (Original) The digital payload of claim 1 further comprising a digital-to-analog (D/A) converter.

13. (Original) The digital payload of claim 12 wherein the D/A converter is further configured to operate at an RF frequency rate.

14. (Currently Amended) An all-digital payload for processing a plurality of sub-band spectra received on a plurality of uplink beams at a communications satellite, the digital payload comprising:

a digital channelizer configured to divide each of the sub-band spectra into a plurality of data packets the sub-band spectra being in an intermediate frequency (IF);

a digital switch matrix configured to route each of the plurality of data packets to at least one of a plurality of receiving ports;

an embeddable digital regeneration module in communication with the digital switch matrix, wherein the digital regeneration module is configured to demodulate at least a portion of the plurality of data packets to extract a digital bitstream therefrom, to digitally process the bitstream, and to remodulate the bitstream after processing; and

a digital combiner configured to communicate with the receiving ports to receive the plurality of data packets and to re-assemble the plurality of data packets to thereby form a plurality of output sub-bands for transmission on an output beam of the communications satellite.

15. (Original) A method of processing a sub-band spectrum received on an uplink beam at a digital payload for a communications satellite, the method comprising the steps of:

digitally dividing the sub-band spectrum into a plurality of frequency slices;

routing each of the plurality of frequency slices to at least one of a plurality of receiving ports; and

digitally processing at least a portion of the frequency slices; and

digitally re-assembling the portion of the plurality of frequency slices after processing to thereby form a plurality of output sub-bands for transmission on an output beam of the communications satellite.

16. (Original) The method of claim 15 further comprising the steps of converting the analog uplink beam to a digital representation of the sub-band spectrum prior to the dividing step.

17. (Original) The method of claim 16 wherein the converting step occurs at an IF frequency rate.

18. (Original) The method of claim 15 wherein the routing step comprises simultaneously routing at least a portion of the plurality of frequency slices to multiple receiving ports to thereby implement a multi-cast function.

19. (Original) The method of claim 15 further comprising the steps of monitoring the sub-band spectrum to identify changes in bandwidth consumption and adjusting the routing step in response to the changes to thereby improve the efficiency of the digital payload.

20. (Original) A satellite receiving a plurality of uplink beams and producing a plurality of downlink beams, the satellite comprising:

an uplink antenna configured to receive the plurality of uplink beams;

a downlink antenna configured to produce the plurality of downlink beams;

an analog-to-digital (A/D) converter configured to convert the uplink beams to digital uplink equivalents;

an all-digital payload comprising:

a digital channelizer configured to receive the digital uplink equivalents and to divide the digital uplink equivalents into a plurality of frequency slices;

a digital switch matrix configured to route each of the plurality of frequency slices to at least one of a plurality of receiving ports; and

a digital combiner configured to communicate with the receiving ports to receive the plurality of frequency slices and to re-assemble the plurality of frequency slices to thereby form a plurality of digital output sub-bands; and

a digital to analog (D/A) converter configured to convert the digital output sub-bands to downlink beams transmitted by the downlink antenna.

21. (Original) The satellite of claim 20 wherein the A/D converter is further configured to sample the uplink beams at an IF frequency.

22. (Original) The satellite of claim 20 wherein the D/A converter is further configured to sample the output sub-bands at an RF frequency.

23. (Original) The satellite of claim 20 wherein the uplink antenna is a digital beam-forming antenna.

24. (Original) The satellite of claim 20 wherein the uplink antenna is a phased array antenna.

25. (Original) The satellite of claim 20 wherein the downlink antenna is a digital beam-forming antenna.

26. (Original) The satellite of claim 20 wherein the downlink antenna is a phased array antenna.

27. (Previously Presented) A digital payload for a satellite configured to receive a plurality of sub-band spectra via an uplink beam and to provide a downlink beam, the digital payload comprising:

a backplane housing having a backplane bus; and

a plurality of processing cards, each processing card comprising:

a channelizer circuit configured to receive at least one of the plurality of sub-band spectra and to divide the at least one of the plurality of sub-band spectra into a plurality of frequency slices;

a digital switch matrix comprising a plurality of switching circuits, wherein each of the plurality of switching circuits is configured to route a portion of the plurality of frequency slices to at least one of a plurality of receiving ports via the backplane bus; and

a digital combiner circuit configured to communicate with the receiving ports to receive the plurality of frequency slices and to re-assemble

the plurality of frequency slices to thereby form an output sub-band for transmission on the output beam.

28. (Previously Presented) The digital payload of claim 27 wherein each of the plurality of processing cards further comprises a regeneration circuit configured to demodulate at least a portion of the at least one of the plurality of sub-band spectra to thereby extract a digital bitstream therefrom, to digitally process the bitstream, and to remodulate the bitstream after processing.

29. (Original) Means for processing a sub-band spectrum received on an uplink beam at a communications satellite, the means for processing comprising:

means for dividing the sub-band spectrum into a plurality of frequency slices;

means for routing each of the plurality of frequency slices to at least one of a plurality of receiving ports; and

means for communicating with the receiving ports to receive the plurality of frequency slices and to re-assemble the plurality of frequency slices to thereby form a plurality of output sub-bands for transmission on an output beam of the communications satellite.

30. (Original) The means for processing of claim 29 further comprising a means for digitally regenerating the sub-band spectrum, wherein the means for digitally regenerating comprises means for demodulating at least a portion of the sub-band spectrum to extract a digital bitstream therefrom, means for digitally processing the bitstream, and means for remodulating the bitstream after processing.

31-35 (Cancelled).

36. (Previously Presented) A digital payload for processing a sub-band spectrum received on an uplink beam at a communications satellite, the digital payload comprising:

a digital channelizer configured to divide the sub-band spectrum into a plurality of frequency slices;

a digital switch matrix configured to route each of the plurality of frequency slices to at least one of a plurality of receiving ports;

a digital combiner configured to communicate with the receiving ports to receive the plurality of frequency slices and to re-assemble the plurality of frequency slices to thereby form a plurality of output sub-bands for transmission on an output beam of the communications satellite; and

a digital regeneration module configured to demodulate at least a portion of the sub-band spectrum to extract a digital bitstream therefrom, to digitally process the bitstream, and to remodulate the bitstream after processing, and wherein the digital regeneration module is further configured to digitally process the bitstream by performing network registration.

37. (Previously Presented) A digital payload for processing a sub-band spectrum received on an uplink beam at a communications satellite, the digital payload comprising:

a digital channelizer configured to divide the sub-band spectrum into a plurality of frequency slices;

a digital switch matrix configured to route each of the plurality of frequency slices to at least one of a plurality of receiving ports;

a digital combiner configured to communicate with the receiving ports to receive the plurality of frequency slices and to re-assemble the plurality of frequency slices to thereby form a plurality of output sub-bands for transmission on an output beam of the communications satellite; and

a digital regeneration module configured to demodulate at least a portion of the sub-band spectrum to extract a digital bitstream therefrom, to digitally process the bitstream, and to remodulate the bitstream after processing, and wherein the digital regeneration module is further configured to digitally process the bitstream by performing cryptographic manipulation of the bitstream.

38. (Previously Presented) A method of processing a sub-band spectrum received on an uplink beam at a digital payload for a communications satellite, the method comprising the steps of:

converting the analog uplink beam to a digital representation of the sub-band spectrum;

digitally dividing the digital representation of the sub-band spectrum into a plurality of frequency slices;

routing each of the plurality of frequency slices to at least one of a plurality of receiving ports; and

digitally processing at least a portion of the frequency slices; and

digitally re-assembling the portion of the plurality of frequency slices after processing to thereby form a plurality of output sub-bands for transmission on an output beam of the communications satellite.